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(54) **APPARATUS AND METHOD FOR AUTOMATICALLY PROVIDING INFORMATION TO A NEW COMPUTER**

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(60) Provisional application No. 61/542,122, filed on Sep. 30, 2011.

(51) **Int. Cl.**

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G06K 7/00	(2006.01)
G06K 19/06	(2006.01)
G06K 7/14	(2006.01)

(52) **U.S. Cl.**
USPC **235/462.11**; 235/462.01; 235/435; 235/454; 235/462.15

(58) **Field of Classification Search**
USPC 235/462.11, 462.01, 435, 454, 462.15
See application file for complete search history.

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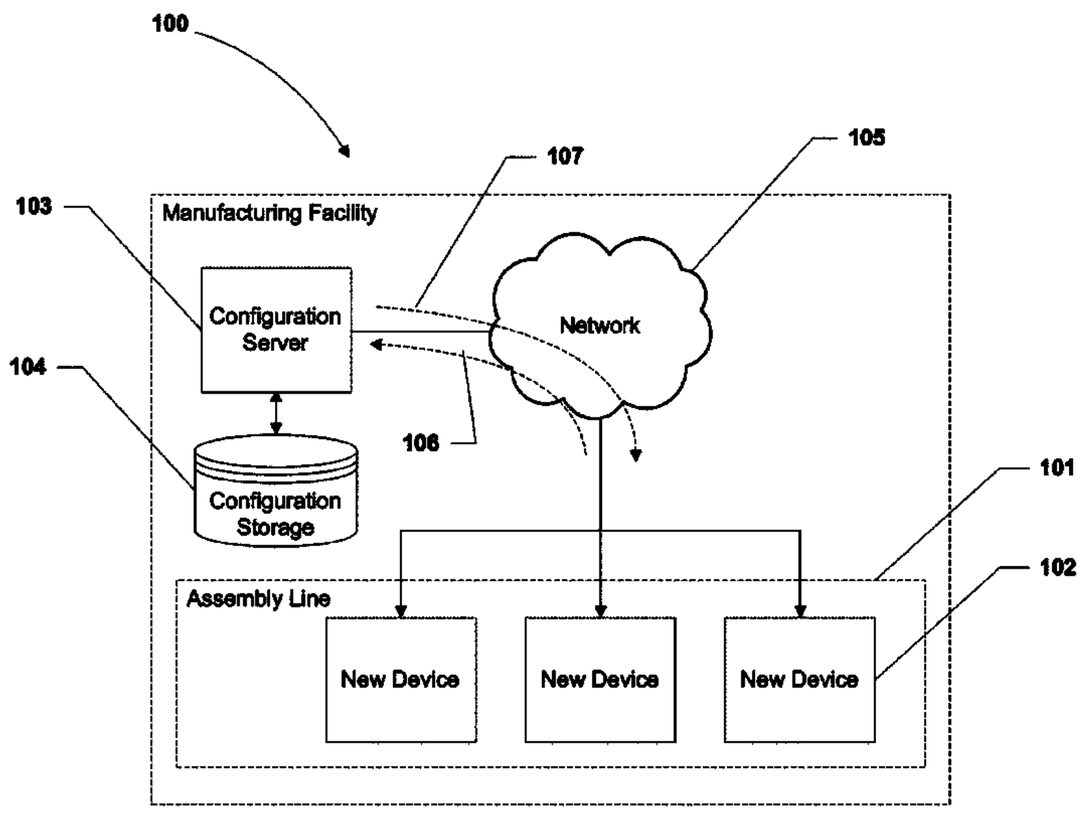
(57) **ABSTRACT**

A system and method is disclosed for automatically providing information to a newly-manufactured computing device. During the manufacture of a new computing device at an assembly line, a camera integrated with the computing device is automatically activated as a barcode scanner. On the camera viewing a barcode that includes device-specific configuration information, the barcode is read by the computing device to read the device-specific configuration information for storage in a non-volatile memory of the device.

19 Claims, 5 Drawing Sheets



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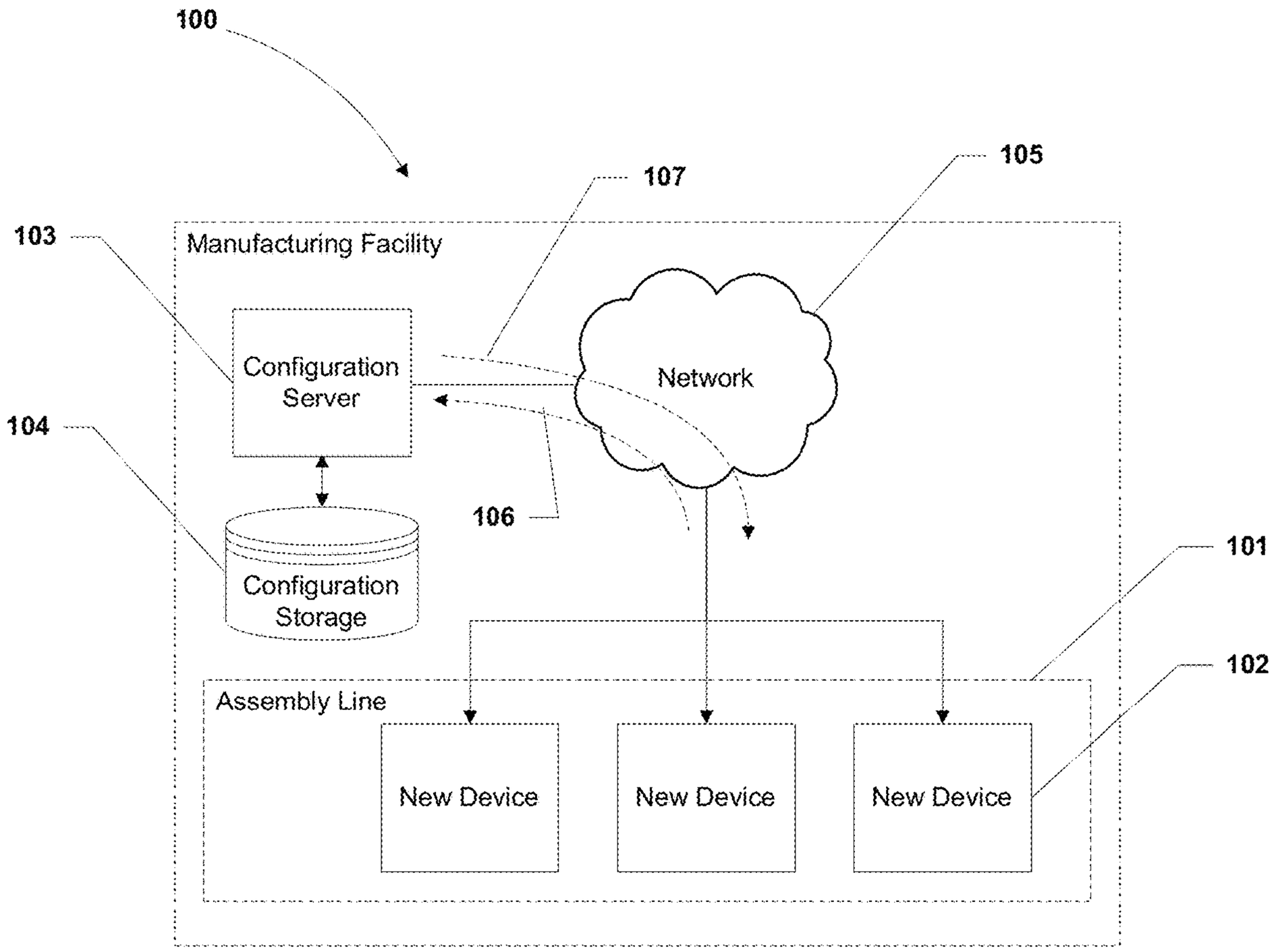
100
107
105
103
Manufacturing Facility
Configuration Server
Network
104
106
Configuration Storage
101
102
Assembly Line
New Device
New Device
New Device

FIG. 1

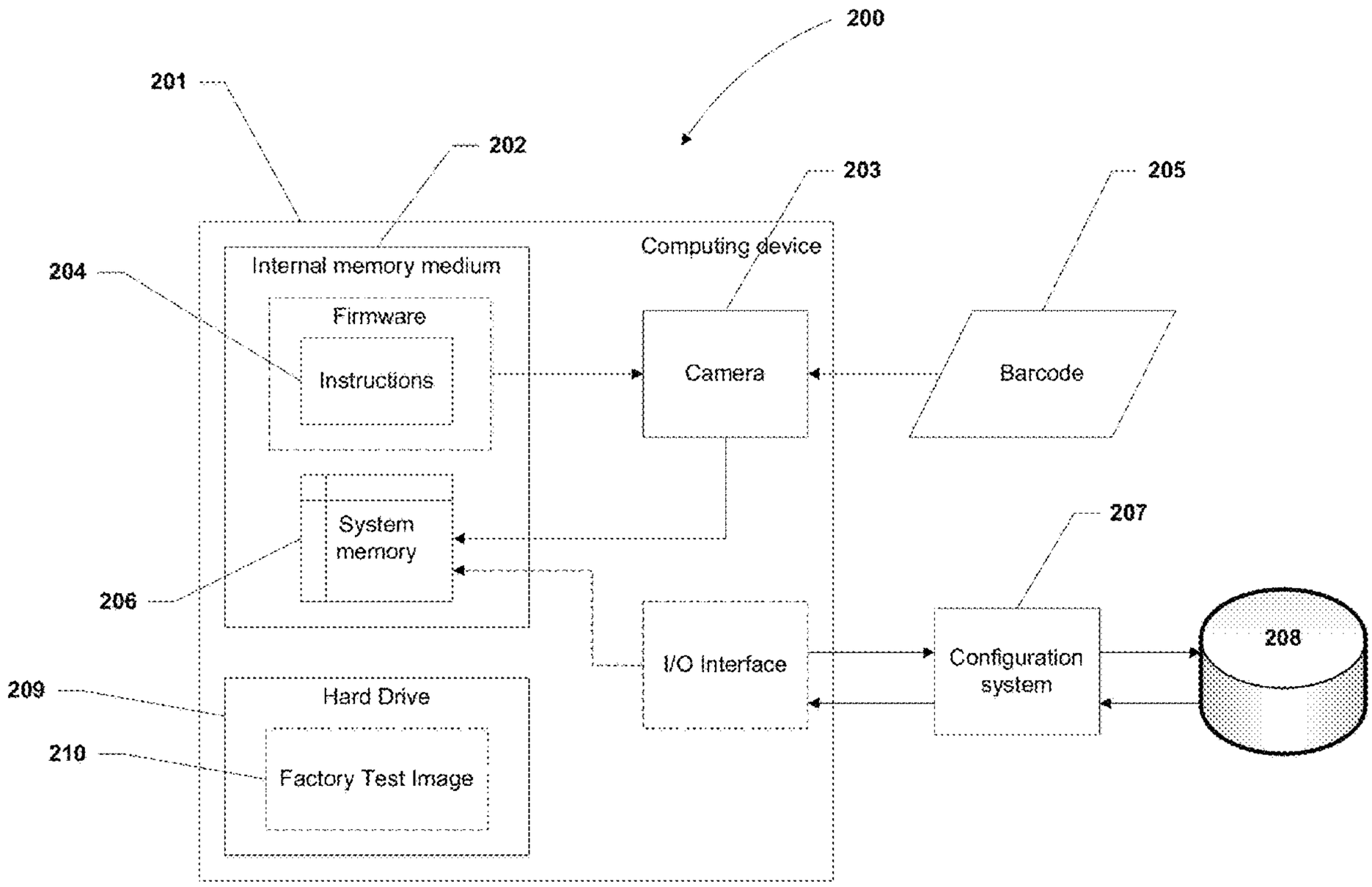
200
201
202
203
205
Computing device
Internal memory medium
204
Firmware
Instructions
Camera
Barcode
System memory
207
206
I/O Interface
Configuration system
208
209
Hard Drive
210
Factory Test Image

FIG. 2

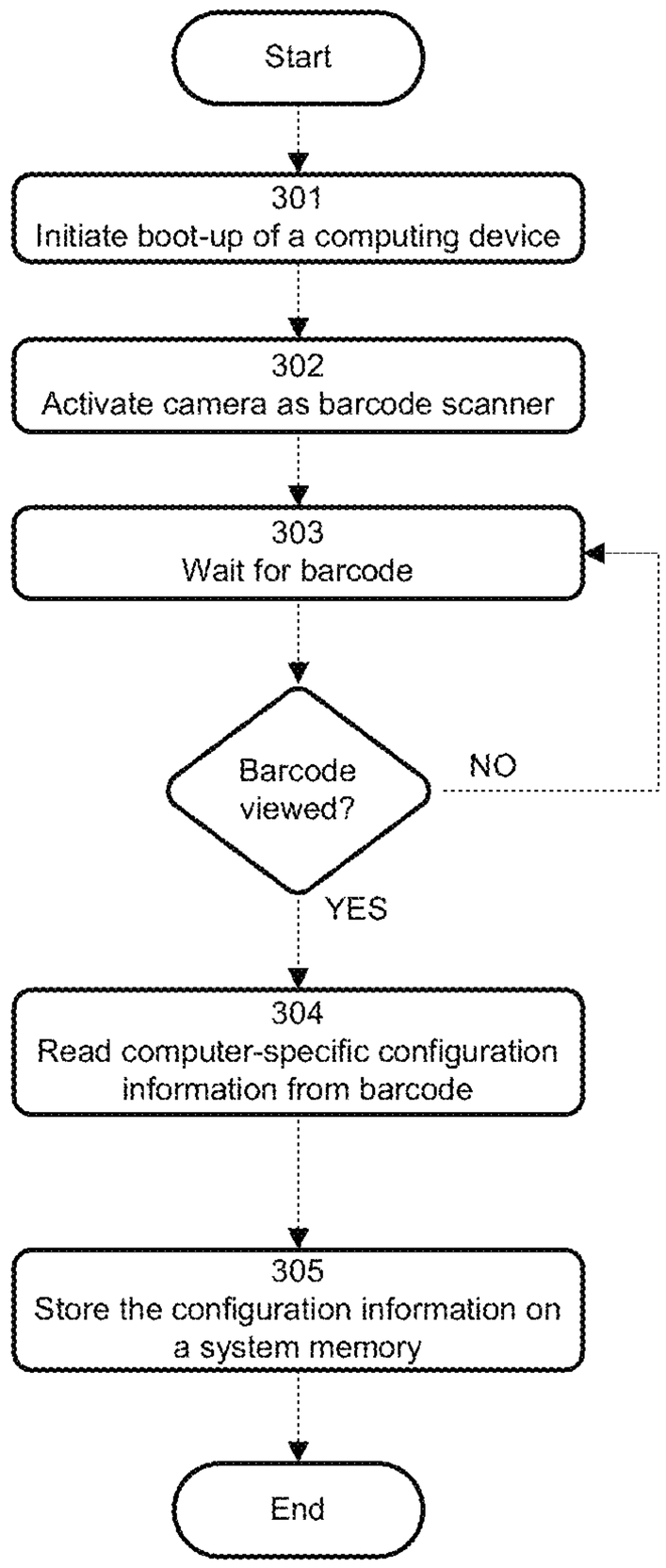
Start
301
Initiate boot-up of a computing device
302
Activate camera as barcode scanner
303
Wait for barcode
Barcode viewed?
NO
YES
304
Read computer-specific configuration information from barcode
305
Store the configuration information on a system memory
End

FIG. 3

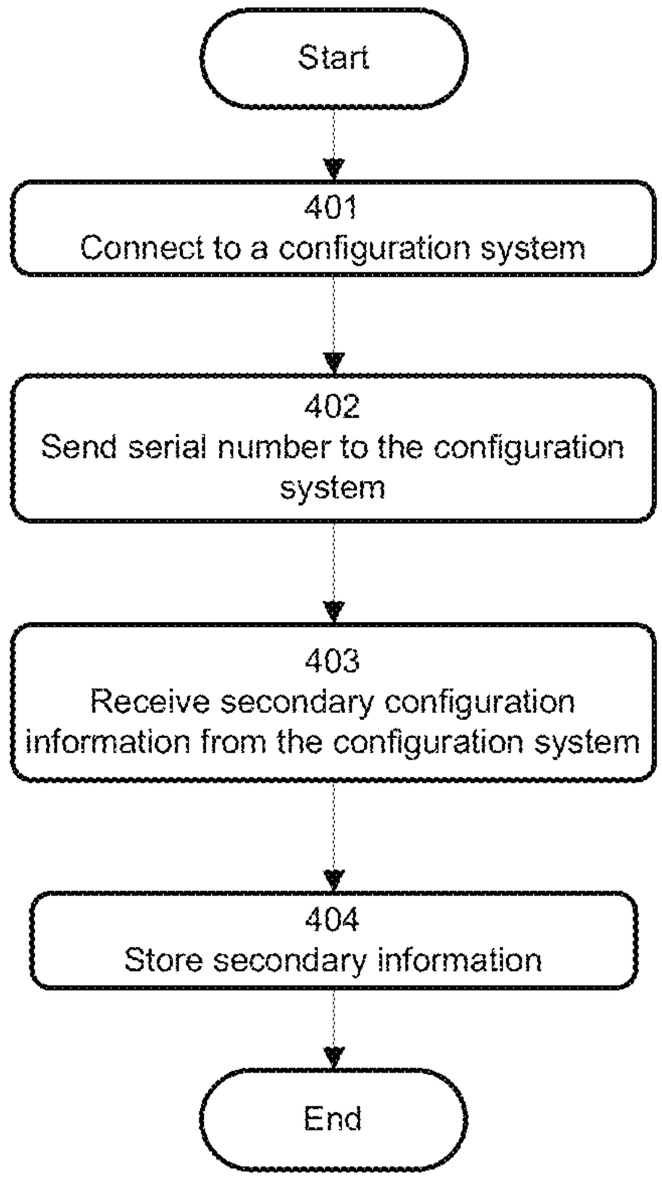
Start
401
Connect to a configuration system
402
Send serial number to the configuration system
403
Receive secondary configuration information from the configuration system
404
Store secondary information
End

FIG. 4

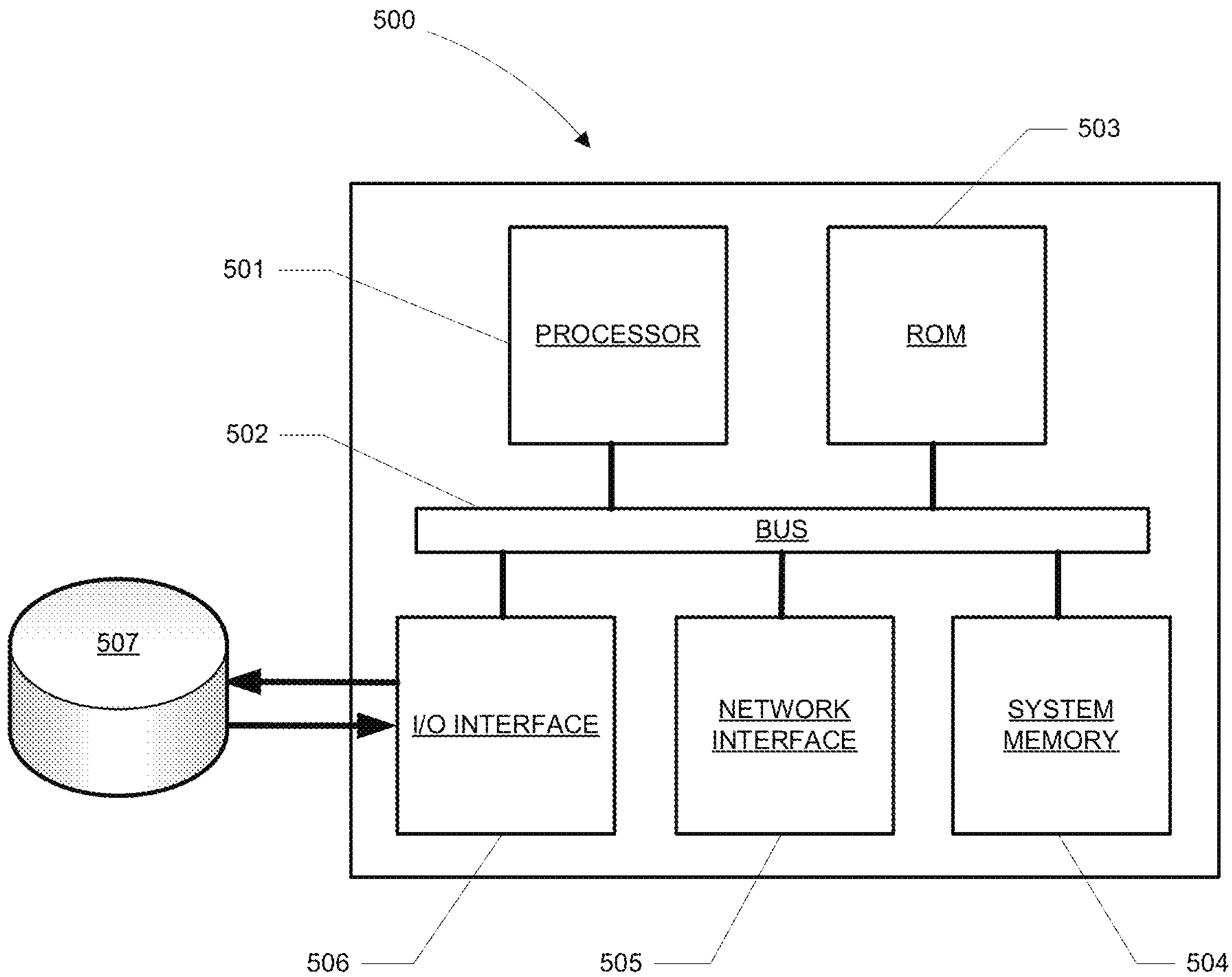
500
503
501
PROCESSOR
ROM
502
BUS
507
I/O INTERFACE
NETWORK INTERFACE
SYSTEM MEMORY
506
505
504

FIG. 5

APPARATUS AND METHOD FOR AUTOMATICALLY PROVIDING INFORMATION TO A NEW COMPUTER

REFERENCE TO RELATED APPLICATIONS

The present application claims priority from and is a continuation of previously filed U.S. application Ser. No. 13/273,181, filed Oct. 13, 2011, which claims priority benefit under 35 U.S.C. §119(e) from U.S. Provisional Application No. 61/542,122, filed Sep. 30, 2011, the subject matter of both prior applications incorporated herein by reference in their entirety.

TECHNICAL FIELD

The subject technology relates generally to the manufacturing and testing of computing devices.

BACKGROUND

During the manufacturing process, a new computer must be taught certain information about itself (for example, its serial number, memory, speed, operating system, hardware capabilities, and the like). Currently, providing the computer with this information includes manually scanning with a barcode reader a barcode attached to the computer to retrieve a serial number, using that serial number to retrieve information specific to the computer, and then manually loading that information into the computer.

SUMMARY

The subject technology provides a system and computer-implemented method for automatically providing information to a newly-manufactured computing device. According to one aspect, the system includes activating an integrated camera associated with the computing device as a barcode scanner, waiting for a barcode to be viewed by the integrated camera, and, on the integrated camera viewing a barcode that includes device-specific configuration information, reading the barcode to read the device-specific configuration information, and storing the device-specific configuration information on a system memory of the computing device. In another aspect, the method may include connecting to a configuration system via a network connection, transmitting to the configuration system the serial number, receiving from the configuration system, secondary configuration information about the computing device, and, on receiving the secondary configuration information, automatically storing the secondary configuration information to the system memory.

It is understood that other configurations of the subject technology will become readily apparent to those skilled in the art from the following detailed description, wherein various configurations of the subject technology are shown and described by way of illustration. As will be realized, the subject technology is capable of other and different configurations and its several details are capable of modification in various other respects, all without departing from the scope of the subject technology. Accordingly, the drawings and detailed description are to be regarded as illustrative in nature and not as restrictive.

BRIEF DESCRIPTION OF THE DRAWINGS

A detailed description will be made with reference to the accompanying drawings:

FIG. **1** is a diagram of a system, including an assembly line, for automatically providing information to newly-manufactured computing devices according to one aspect of the subject technology.

FIG. **2** is a diagram of a computing device, including an integrated camera, and a barcode for automatically providing information to a newly-manufactured computing device according to one aspect of the subject technology.

FIG. **3** is a flowchart illustrating a process for automatically providing configuration information to a newly-manufactured computing device according to one aspect of the subject technology.

FIG. **4** is a flowchart illustrating a process for automatically downloading configuration information to a newly-manufactured computing device according to one aspect of the subject technology.

FIG. **5** is a diagram illustrating a machine or computer for automatically providing information to a newly-manufactured computing device, including a processor and other internal components, according to one aspect of the subject technology.

DETAILED DESCRIPTION

FIG. **1** is a diagram of a system, including an assembly line, for automatically providing information to newly-manufactured computing devices according to one aspect of the subject technology. A system **100** may include an assembly line **101** configured to receive for configuration one or more computing devices **102**, a configuration server **103**, and a configuration storage **104** (for example, a database or file system). Assembly line **101** may include a sequential organization of technicians, tools or machines, and/or parts to facilitate the configuration of a one or more devices **102**. Configuration server **103** may be operably connected to the one or more devices **102** at assembly line **101** using a wired or wireless network **105** (for example, a secure WAN, LAN, or the Internet). Each device **102** may be connected using an Ethernet cable to a local area network (LAN) using a local router, or each device **102** may be configured to include a wireless connection to a wireless router.

A computing device **102** compatible with assembly line **101** may include, for example, a notebook computer, tablet computer, personal digital assistant (PDA), smart phone, or the like. Each computing device **102** may include an integrated camera (for example, a camera built into a display of the device). During the configuration of a device **102** at assembly line **101**, the camera of device **102** may be activated and presented with a barcode that includes a serial number associated with the device. The camera may be configured to automatically read the barcode to read and/or store the serial number, and then automatically transmit **106** the serial number to configuration server **103** using network **105**. A configuration server **103** may be configured to receive the serial number scanned at assembly line **101** by the camera, and facilitate the download to the device of further device-specific configuration information associated with the serial number.

FIG. **2** is a diagram of a computing device, including an integrated camera, and a barcode for automatically providing information to a newly-manufactured computing device according to one aspect of the subject technology. A computing device **201** may include one or more internal memory mediums **202** and an associated camera **203**. Camera **203** may include an integrated camera (for example, built into a display) or may be a component separate from, or configurably mountable to, computing device **201**. An internal memory medium **202** may include firmware instructions **204** that,

when executed by a processor associated with computing device **201** (see, for example, FIG. **4**), configure computing device **201** to initiate a boot up and to activate camera **203** as a barcode scanner. In one aspect, device **201** is configured to execute firmware instructions **204** when powered on for the first time.

When camera **203** is activated as a barcode scanner, a barcode **205** may be positioned to be viewable by camera **203**. For example, barcode **205** may be placed in front of the camera by an assembly line technician, or automatically by machinery at assembly line **101**. Camera **203** may automatically read encoded information from barcode **205** and store the encoded information onto an internal system memory **206**. System memory **206** may be implemented as a secure area or partition on the same internal memory medium **202** that stores firmware instructions **204**, or, in other aspects, implemented as a separate internal memory medium **202**.

System memory **206** may be a write-once memory (for example, an EPROM, EEPROM, or other non-volatile memory), wherein, once the information is stored thereon, the information becomes read-only. For example, after storing the device-specific configuration information on system memory **206**, computing device **201** may be configured to set system memory **206** to a read-only state (for example, by applying a voltage to one or more specific pins of an EPROM or EEPROM).

Barcode **205** may be encoded with information related to the computing device **201**. For example, barcode **205** may include a serial number of device **201**, along with secondary configuration information related to, for example, memory, speed, operating system, hardware capabilities, and the like. In this regard, barcode **205** may be a matrix 2D barcode having the serial number and secondary configuration information encoded thereon. On reading barcode **205**, computing device **201** may receive configuration information about itself.

In one aspect, barcode **204** may be encoded with limited information, such as a serial number. On reading a serial number from barcode **205**, computing device **201** may be configured to connect to configuration system **207** (for example, including configuration computer **103**) to retrieve the previously described information. Firmware instructions **204**, when executed, may cause the processor to connect to configuration system **207**, including storage **208** for storing configuration information (for example, configuration storage **104**), by means of a connection through a network (for example, network **105**). Computing device **201** may transmit to configuration system **207** the serial number read from barcode **205** to receive the previously described secondary configuration information about the computing device. To this end, configuration system **207** and/or storage **208** may be configured to store the previously described secondary configuration information for one or more computing devices **201**, indexed by serial numbers. On configuration system **207** receiving a serial number, configuration system **207** may perform a lookup of the secondary configuration information and then transmit the secondary configuration information to computing device **201** for storage at system memory **206**.

In another aspect, activating camera **203**, reading barcode **205**, storing the serial number and/or secondary configuration information to system memory **206**, and the like, may be the result of executing instructions from a location different than internal memory medium **202**. In one example, computing device **201** may include a memory medium **209** (for example, a hard drive, removable flash drive, USB drive, or the like) for storing a factory boot image **210**. Boot image **210** may not include standard operating system features (for example, a browser), but, rather, may include a limited feature set for configuring and/or testing the hardware systems of a computing device (for example, physical memory addresses and hardware functions, network capability, and the like). Boot image **210** may be responsible for, among other things, configuring device **201**. Computing device **201** may be configured, on a power up, to access and load the previously described firmware instructions **204** from internal memory medium **202** and to initiate a further boot up of the device by loading and executing a boot image **210**. Boot image **210**, when executed, may then activate camera **203** and wait to read configuration information from a barcode **205**.

FIG. **3** is a flowchart illustrating a process for automatically providing configuration information to a newly-manufactured computing device according to one aspect of the subject technology. According to one aspect, computing device (for example, computing device **101**) may be configured with configuration instructions that, when executed on a start up of the computing device, automatically configure the device to load configuration information. In a first process **301**, a boot-up of the computing device is initiated (for example, for the first time). In a second process **302**, a camera associated with the computing device is activated as a barcode scanner. In some aspects, the camera may be integrated into the display of the computing device. In a third process **303**, the camera remains idle and waits for a barcode to be positioned to be viewable by the camera. On the camera viewing a barcode that includes device-specific configuration information, in a fourth process **304**, the camera reads the barcode to read the device-specific configuration information, and then, in a fifth process **305**, the computing device stores the device-specific configuration information in a system memory.

FIG. **4** is a flowchart illustrating a process for automatically downloading configuration information to a newly-manufactured computing device according to one aspect of the subject technology. In some aspects, the device-specific configuration information includes a serial number. The instructions, when executed, may cause the computing device to, in a sixth process **401**, connect to an configuration system through a network connection. In a seventh process **402**, the computing device sends the serial number to the configuration system. In an eighth process **403**, in response to receiving the serial number at the configuration system, secondary configuration information about the computing device is sent from the configuration system to the computing device. In a ninth process **404**, the secondary configuration information is stored to the computing device.

Therefore, using the subject technology, a new computing device, in an assembly line, may be activated to load and execute initiation instructions stored thereon to activate a camera associated with the new device as a barcode scanner. A barcode, including information related to the new device, may be positioned to be viewable by the camera. On the camera viewing the barcode, the information is read by the camera and stored on a system memory of the computing device. In some aspects, the device may connect to an configuration system to download secondary configuration information based on the information related to the computing device, and then store the secondary configuration information on a system memory of the computing device. In a further aspect, a technician working in the assembly line may verify that the information was stored to the system memory.

FIG. **5** is a diagram illustrating a machine or computer for automatically providing information to a newly-manufactured computing device, including a processor and other internal components, according to one aspect of the subject technology. In some aspects, a computerized device **500** (for

example, computing device **102**, configuration server **103**, or the like) includes several internal components such as a processor **501**, a system bus **502**, read-only memory **503**, system memory **504**, network interface **505**, I/O interface **506**, and the like. In one aspect, processor **501** may also be communication with a storage medium **507** (for example, a hard drive, database, or data cloud) via I/O interface **506**. In some aspects, all of these elements of device **500** may be integrated into a single device. In other aspects, these elements may be configured as separate components.

Processor **501** may be configured to execute code or instructions to perform the operations and functionality described herein, manage request flow and address mappings, and to perform calculations and generate commands. Processor **501** is configured to monitor and control the operation of the components in server **500**. The processor may be a general-purpose microprocessor, a microcontroller, a digital signal processor (DSP), an application specific integrated circuit (ASIC), a field programmable gate array (FPGA), a programmable logic device (PLD), a controller, a state machine, gated logic, discrete hardware components, or a combination of the foregoing. One or more sequences of instructions may be stored as firmware on a ROM within processor **501**. Likewise, one or more sequences of instructions may be software stored and read from system memory **505**, ROM **503**, or received from a storage medium **507** (for example, via I/O interface **506**). ROM **503**, system memory **505**, and storage medium **507** represent examples of machine or computer readable media on which instructions/code may be executable by processor **501**. Machine or computer readable media may generally refer to any medium or media used to provide instructions to processor **501**, including both volatile media, such as dynamic memory used for system memory **504** or for buffers within processor **501**, and non-volatile media, such as electronic media, optical media, and magnetic media.

In some aspects, processor **501** is configured to communicate with one or more external devices (for example, via I/O interface **506**). Processor **501** is further configured to read data stored in system memory **504** and/or storage medium **507** and to transfer the read data to the one or more external devices in response to a request from the one or more external devices. The read data may include one or more web pages and/or other software presentation to be rendered on the one or more external devices. The one or more external devices may include a computing system such as a personal computer, a server, a workstation, a laptop computer, PDA, smart phone, and the like.

In some aspects, system memory **504** represents volatile memory used to temporarily store data and information used to manage device **500**. According to one aspect of the subject technology, system memory **504** is random access memory (RAM) such as double data rate (DDR) RAM. Other types of RAM also may be used to implement system memory **504**. Memory **504** may be implemented using a single RAM module or multiple RAM modules. While system memory **504** is depicted as being part of device **500**, those skilled in the art will recognize that system memory **504** may be separate from device **500** without departing from the scope of the subject technology. Alternatively, system memory **504** may be a non-volatile memory such as a magnetic disk, flash memory, peripheral SSD, and the like.

I/O interface **506** may be configured to be coupled to one or more external devices, to receive data from the one or more external devices and to send data to the one or more external devices. I/O interface **506** may include both electrical and physical connections for operably coupling I/O interface **506** to processor **501**, for example, via the bus **502**. I/O interface **506** is configured to communicate data, addresses, and control signals between the internal components attached to bus **502** (for example, processor **501**) and one or more external devices (for example, a hard drive). I/O interface **506** may be configured to implement a standard interface, such as Serial-Attached SCSI (SAS), Fiber Channel interface, PCI Express (PCIe), SATA, USB, and the like. I/O interface **506** may be configured to implement only one interface. Alternatively, I/O interface **506** may be configured to implement multiple interfaces, which are individually selectable using a configuration parameter selected by a user or programmed at the time of assembly. I/O interface **506** may include one or more buffers for buffering transmissions between one or more external devices and bus **502** and/or the internal devices operably attached thereto.

Those of skill in the art would appreciate that the various illustrative blocks, modules, elements, components, methods, and algorithms described herein may be implemented as electronic hardware, computer software, or combinations of both. To illustrate this interchangeability of hardware and software, various illustrative blocks, modules, elements, components, methods, and algorithms have been described above generally in terms of their functionality. Whether such functionality is implemented as hardware or software depends upon the particular application and design constraints imposed on the overall system. Skilled artisans may implement the described functionality in varying ways for each particular application. Various components and blocks may be arranged differently (e.g., arranged in a different order, or partitioned in a different way) all without departing from the scope of the subject technology.

It is understood that the specific order or hierarchy of steps in the processes disclosed is an illustration of exemplary approaches. Based upon design preferences, it is understood that the specific order or hierarchy of steps in the processes may be rearranged. Some of the steps may be performed simultaneously. The accompanying method claims present elements of the various steps in a sample order, and are not meant to be limited to the specific order or hierarchy presented.

The previous description is provided to enable any person skilled in the art to practice the various aspects described herein. The previous description provides various examples of the subject technology, and the subject technology is not limited to these examples. Various modifications to these aspects will be readily apparent to those skilled in the art, and the generic principles defined herein may be applied to other aspects. Thus, the claims are not intended to be limited to the aspects shown herein, but is to be accorded the full scope consistent with the language claims, wherein reference to an element in the singular is not intended to mean "one and only one" unless specifically so stated, but rather "one or more." Unless specifically stated otherwise, the term "some" refers to one or more. Pronouns in the masculine (e.g., his) include the feminine and neuter gender (e.g., her and its) and vice versa. Headings and subheadings, if any, are used for convenience only and do not limit the invention.

The term website, as used herein, may include any aspect of a website, including one or more web pages, one or more servers used to host or store web related content, and the like. Accordingly, the term website may be used interchangeably with the terms web page and server. The predicate words "configured to", "operable to", and "programmed to" do not imply any particular tangible or intangible modification of a subject, but, rather, are intended to be used interchangeably. For example, a processor configured to monitor and control an operation or a component may also mean the processor

being programmed to monitor and control the operation or the processor being operable to monitor and control the operation. Likewise, a processor configured to execute code can be construed as a processor programmed to execute code or operable to execute code.

A phrase such as an "aspect" does not imply that such aspect is essential to the subject technology or that such aspect applies to all configurations of the subject technology. A disclosure relating to an aspect may apply to all configurations, or one or more configurations. An aspect may provide one or more examples. A phrase such as an aspect may refer to one or more aspects and vice versa. A phrase such as an "embodiment" does not imply that such embodiment is essential to the subject technology or that such embodiment applies to all configurations of the subject technology. A disclosure relating to an embodiment may apply to all embodiments, or one or more embodiments. An embodiment may provide one or more examples. A phrase such as an "embodiment" may refer to one or more embodiments and vice versa. A phrase such as a "configuration" does not imply that such configuration is essential to the subject technology or that such configuration applies to all configurations of the subject technology. A disclosure relating to a configuration may apply to all configurations, or one or more configurations. A configuration may provide one or more examples. A phrase such as a "configuration" may refer to one or more configurations and vice versa.

The word "exemplary" is used herein to mean "serving as an example or illustration." Any aspect or design described herein as "exemplary" is not necessarily to be construed as preferred or advantageous over other aspects or designs.

All structural and functional equivalents to the elements of the various aspects described throughout this disclosure that are known or later come to be known to those of ordinary skill in the art are expressly incorporated herein by reference and are intended to be encompassed by the claims. Moreover, nothing disclosed herein is intended to be dedicated to the public regardless of whether such disclosure is explicitly recited in the claims. No claim element is to be construed under the provisions of 35 U.S.C. §112, sixth paragraph, unless the element is expressly recited using the phrase "means for" or, in the case of a method claim, the element is recited using the phrase "step for." Furthermore, to the extent that the term "include," "have," or the like is used in the description or the claims, such term is intended to be inclusive in a manner similar to the term "comprise" as "comprise" is interpreted when employed as a transitional word in a claim.

What is claimed is:

1. A computer-implemented method for automatically providing information to a plurality of new computing devices, comprising:

in an assembly line comprising a plurality of newly-manufactured computing devices, activating a computing device on the assembly line to electronically load and execute initiation instructions stored on the activated computing device, the initiation instructions automatically activating an integrated camera associated with the activated computing device on the assembly line as a barcode scanner; and

positioning a barcode to be viewable by the integrated camera, the barcode including device information related to the activated computing device on the assembly line,

wherein, upon the integrated camera viewing the barcode, the device information is read by the integrated camera and stored on a system memory of the activated computing device on the assembly line.

2. The computer-implemented method of claim **1**, wherein, on the integrated camera reading the device information, the activated computing device connects to a configuration system to download configuration information about the activated computing device based on the device information.

3. The computer-implemented method of claim **2**, wherein the configuration information is stored on the system memory of the activated computing device.

4. The computer-implemented method of claim **3**, further comprising:

verifying that the configuration information is stored on the system memory.

5. The computer-implemented method of claim **1**, wherein the initiation instructions are stored as firmware on the activated computing device.

6. The computer-implemented method of claim **1**, wherein the initiation instructions are stored as part of a factory boot image on a memory medium associated with the activated computing device, and wherein activating the computing device on the assembly line comprises a power-up of the activated computer device.

7. A computer-implemented method for automatically providing information to a computing device, comprising:

automatically activating an integrated camera associated with the computing device as a barcode scanner;

waiting for a barcode to be viewed by the integrated camera;

upon the integrated camera viewing a barcode that includes device-specific configuration information, automatically reading the barcode to read the device-specific configuration information, and automatically storing the device-specific configuration information on a system memory of the computing device; and

wherein the activating and waiting steps are automatically performed in response to a power on of the computing device and in connection with a boot up of the computing device from a boot image stored on a memory medium of the computing device.

8. The computer-implemented method of claim **7**, wherein the device-specific configuration information includes a serial number, the method further comprising:

connecting to an configuration system via a network connection;

transmitting the serial number to the configuration system;

receiving secondary configuration information about the computing device from the configuration system; and

on receiving the secondary configuration information, automatically storing the secondary configuration information to the system memory.

9. The computer-implemented method of claim **7**, wherein reading the barcode includes reading a matrix 2D barcode, and wherein the device-specific configuration information includes a serial number and secondary configuration information about the computing device.

10. The computing device of claim **7**, wherein the memory medium is a firmware device on a system board of the computing device.

11. The computing device of claim **7**, wherein the memory medium is a hard drive associated with the computing device.

12. A newly-manufactured computing device, comprising:

a processor;

an integrated camera;

a first memory containing configuration instructions configured to be automatically accessed on a power-on of the computing device,

wherein the configuration instructions are automatically executed by the processor on a power-on of the computer device and cause the processor to:

activate the integrated camera as a scanner;

read encoded information positioned in front of the integrated camera, the encoded information including device information related to the computing device;

initiate a transmission of the device information to a configuration system remote from the computing device;

receive configuration information about the computing device based on the transmitted device information; and

store the configuration information about the computing device to the computing device.

13. The newly-manufactured computing device of claim **12**, wherein the configuration instructions are stored on the first memory as a factory test image.

14. The newly-manufactured computing device of claim **13**, wherein the first memory is a hard drive.

15. The newly-manufactured computing device of claim **13**, wherein the transmission is initiated over a network connection with a configuration server at an assembly line, the newly-manufactured computing device being one of multiple devices in the assembly line.

16. The computing device of claim **13**, wherein the device information includes a serial number of the newly-manufactured computing device.

17. The computing device of claim **13**, further comprising a system memory, the configuration information being stored on the system memory, wherein the configuration instructions are implemented as firmware stored on the first memory.

18. The computing device of claim **17**, wherein the system memory is implemented as an EPROM.

19. A computer-implemented method, comprising:

in an assembly line comprising a plurality of computing devices, initiating a boot up of one or more of the computing devices on the assembly line to activate respective integrated cameras associated with the one or more computing devices;

providing at each of the one or more computing devices on the assembly line respective encoded information that, when viewed by an activated camera of a corresponding computing device, provides the corresponding computing device with device information about the corresponding computing device; and

upon a respective computing device on the assembly line receiving the device information, automatically transmitting the device information from the respective computing device on the assembly line to a configuration system, automatically downloading from the configuration system to the respective computing device configuration information based on the transmitted device information, and automatically storing the configuration information to a memory of the respective computing device on the assembly line.

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